

## **Ice deformation, growth, and thickness from small-scale ice motion**

The RADARSAT Geophysical Processor System (RGPS) produces basin-scale estimates of ice motion, deformation, age, and thickness from repeat surveys of Lagrangian ice parcels in high-resolution RADARSAT imagery. These deformations of these polygonal ice areas are defined by the motion of their vertices obtained from tracking common features in time-sequential SAR imagery. These time series of small-scale deformation have provided an unprecedented basin-scale view of the length scale of the lead patterns over the ice cover, the persistence of these linear features, and the response of these patterns to wind forcing. Seasonal ice thickness within the pack is estimated from the record of openings and closings of the ice elements and a simple parameterization of growth rate. From the ice thickness estimates, we can compute the volume of seasonal ice created and ice volume transferred into ridges. The 3-day mapping of the ice cover by RADARSAT provides an estimate of the seasonal ice production over an entire growth season. Three winters and two summers of these products have been produced. Here, this dataset is summarized in terms of the deformation and advection of the ice cover, the lead patterns, and ice production. We compare the behavior of the ice cover over the three winters and discuss these observations in the context of large-scale ice motion and atmospheric pressure pattern. There are sources of uncertainty in these calculations, but there are no adequate surface-based or remote-sensing data for comprehensive evaluation of the estimates. We discuss our approach and that taken by others to validate the RGPS products.